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EXAMINER	
TORRES, JUAN A	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/926,089	ATARASHI ET AL.	
	Examiner	Art Unit	
	Juan A. Torres	2631	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 August 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-36* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-36* is/are rejected.

7)☒ Claim(s) *9* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *11052004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Drawings

The drawings are objected to because:

FIG. 1 shows 2 arrows from block 101-1 to block 140, 1 arrow from 101-2 to block 140 and no arrow from 101-3 to block 140. It is suggested to be changed to 1 arrow from block 101-1 to block 140, 1 arrow from 101-2 to block 140 and 1 arrow from 101-3 to block 140.

FIG. 3 shows 2 arrows from block 101-1 to block 140, 1 arrow from 101-2 to block 140 and no arrow from 101-3 to block 140. It is suggested to be changed to 1 arrow from block 101-1 to block 140, 1 arrow from 101-2 to block 140 and 1 arrow from 101-3 to block 140.

FIG. 4 shows 2 arrows from block 101-1 to block 140, 1 arrow from 101-2 to block 140 and no arrow from 101-3 to block 140. It is suggested to be changed to 1 arrow from block 101-1 to block 140, 1 arrow from 101-2 to block 140 and 1 arrow from 101-3 to block 140.

FIG. 5 shows 2 arrows from block 101-1 to block 140, 1 arrow from 101-2 to block 140 and no arrow from 101-3 to block 140. It is suggested to be changed to 1 arrow from block 101-1 to block 140, 1 arrow from 101-2 to block 140 and 1 arrow from 101-3 to block 140.

FIG. 5 shows 2 arrows from block 201-1 to block 212, 1 arrow from 201-2 to block 212 and no arrow from 201-3 to block 212. It is suggested to be changed to 1 arrows from block 201-1 to block 212, 1 arrow from 201-2 to block 212 and 1 arrow from 201-3 to block 212.

FIG. 6 shows 2 arrows from block 101-1 to block 140, 1 arrow from 101-2 to block 140 and no arrow from 101-3 to block 140. It is suggested to be changed to 1 arrows from block 101-1 to block 140, 1 arrow from 101-2 to block 140 and 1 arrow from 101-3 to block 140

FIG. 6 shows 2 arrows from block 201-1 to block 212, 1 arrow from 201-2 to block 212 and no arrow from 201-3 to block 212. It is suggested to be changed to 1 arrows from block 201-1 to block 212, 1 arrow from 201-2 to block 212 and 1 arrow from 201-3 to block 212.

FIG. 6 shows 2 arrows from block 214 to block 201-1, 1 arrow from 214 to block 201-2 and no arrow from 214 to block 201-3. It is suggested to be changed to 1 arrow from block 214 to block 201-1, 1 arrow from 214 to block 201-2 and 1 arrow from 214 to block 201-3.

FIG. 6 shows 2 arrows from block 201-1 to block 123, 1 arrow from 201-2 to block 123 and no arrow from 201-3 to block 123. It is suggested to be changed to 1 arrows from block 201-1 to block 123, 1 arrow from 201-2 to block 123 and 1 arrow from 201-3 to block 123.

FIG. 6 shows 2 arrows from block 216 to block 201-1, 1 arrow from 216 to block 201-2 and no arrow from 216 to block 201-3. It is suggested to be changed to 1 arrow

from block 216 to block 201-1, 1 arrow from 216 to block 201-2 and 1 arrow from 216 to block 201-3.

FIG. 7 shows 2 arrows from block 101-1 to block 140, 1 arrow from 101-2 to block 140 and no arrow from 101-3 to block 140. It is suggested to be changed to 1 arrows from block 101-1 to block 140, 1 arrow from 101-2 to block 140 and 1 arrow from 101-3 to block 140

FIG. 7 shows 2 arrows from block 201-1 to block 212, 1 arrow from 201-2 to block 212 and no arrow from 201-3 to block 212. It is suggested to be changed to 1 arrows from block 201-1 to block 212, 1 arrow from 201-2 to block 212 and 1 arrow from 201-3 to block 212.

FIG. 7 shows 2 arrows from block 216 to block 201-1, 1 arrow from 216 to block 201-2 and no arrow from 216 to block 201-3. It is suggested to be changed to 1 arrow from block 216 to block 201-1, 1 arrow from 216 to block 201-2 and 1 arrow from 216 to block 201-3.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for

consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. The replacement sheet(s) should be labeled "Replacement Sheet" in the page header (as per 37 CFR 1.84(c)) so as not to obstruct any portion of the drawing figures. If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

The disclosure is objected to because of the following informalities:

In page 5 line 37 the recitation "SAC-10, Dec 1992" is suggested to be changed to "SAC-10, Oct 1992".

In page 28 line 26 the recitation "complementary ,by" is suggested to be changed to "complementary, by".

In page 34 line 22 the recitation "220-M" is suggested to be changed to "220-m".

In page 40 line 3 the recitation "177" is suggested to be changed to "117".

In page 40 line 7 the recitation "177" is suggested to be changed to "117".

In page 54 line 4 the recitation "226" is suggested to be changed to "224".

In page 54 line 6 the recitation "226" is suggested to be changed to "224".

In page 54 line 9 the recitation "(a)" is suggested to be changed to "(a1)".

In page 54 line 14 the recitation "226" is suggested to be changed to "224".

In page 61 line 26 the recitation "264" is suggested to be changed to "264 of Fig. 26".

In page 64 line 10 the recitation "Fig. 29" is suggested to be changed to "Fig. 28".

Appropriate correction is required.

Claim Objections

Claim 9 is objected to because of the following informalities: in line 2 the recitation "claimed in claim 1, wherein said channel estimation" is indefinite because claim 1 doesn't disclose a channel estimation. It is suggested to be changed to "claimed in claim 6, wherein said channel estimation". Appropriate correction is required.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 6-14, 27, 28, 34 and 35 are rejected under 35 U.S.C. 102(e) as being anticipated by Song (US 6721299).

As per claim 6 Song (US 6721299) discloses a channel estimation method for estimating channel variation using pilot symbols, said method comprising: a pilot symbol acquiring step for acquiring pilot symbols of a known phase included in received packets (figure 15A column 16 line 8-11); and a channel estimation step for implementing channel estimation using said acquired pilot symbols (figure 15A column 16 line 15-18).

As per claim 7 Song (US 6721299) discloses pilot symbols of a known phase are time-multiplexed with the packets (figure 3 column 2 line 22-25).

As per claim 8 Song (US 6721299) discloses pilot symbols of a known phase are code-multiplexed with the packets (column 2 line 20-21).

As per claim 9 Song (US 6721299) discloses a channel estimation step that implements channel estimation by combining pilot symbols of a known phase and pilot symbols included in other packets transmitted from the same transmission source (column 6 lines 57-63).

As per claim 10 Song (US 6721299) discloses a channel estimation method for estimating channel variation using pilot symbols, said method comprising: a pilot symbol acquiring step for acquiring pilot symbols of a known phase included in a common control channel in a multiplexed manner (column 6 line 67-column 7 line 9, figure 15A column 16 line 8-11); and a channel estimation step for implementing channel estimation using said acquired pilot symbols (figure 15A column 16 line 15-18).

As per claim 11 Song (US 6721299) discloses pilot symbols of a known phase are time-multiplexed with the packets (figure 3 column 2 line 22-25).

As per claim 12 Song (US 6721299) discloses pilot symbols of a known phase are code-multiplexed with the packets (column 2 line 20-21).

As per claim 13 Song (US 6721299) discloses a channel estimation step that implements channel estimation by combining pilot symbols of a known phase and pilot symbols included in other packets transmitted from the same transmission source (column 6 lines 57-63).

As per claim 14 Song (US 6721299) discloses a channel estimation method for estimating channel variation using pilot symbols comprising a first pilot symbol acquiring step for acquiring pilot symbols of a known phase included in packets and in a common control channel in a multiplexed manner (column 13 lines 29-32); a second pilot symbol acquiring step for acquiring pilot symbols of a known phase included in said common control channel; (column 13 lines 42-45) and a channel estimation step for implementing channel estimation using said acquired pilot symbols (column13 lines 33-35).

As per claim 27 Song (US 6721299) discloses a communication device for implementing channel estimation for estimating channel variation using pilot symbols comprising a pilot symbol acquiring part for acquiring pilot symbols of a known phase included in packets and in a common control channel in a multiplexed manner (figure 14A column 13 lines 29-32); and a channel estimation part for implementing channel estimation using said acquired pilot symbols (figure 14H column 13 lines 33-45).

As per claim 28 Song (US 6721299) discloses a communication device for implementing channel estimation for estimating channel variation using pilot symbols comprising a first pilot symbol acquiring part for acquiring pilot symbols of a known phase included in packets and in a common control channel in a multiplexed manner (figure 14A column 13 lines 29-32); a second pilot symbol acquiring part for acquiring pilot symbols of a known phase included in said common control channel (figure 14A column 13 lines 29-32); and a channel estimation part for implementing channel estimation using said acquired pilot symbols (figure 14H column 13 lines 33-45).

As per claim 34 Song (US 6721299) discloses a communication device comprising path search and channel estimation means for implementing at least one of path search and channel estimation using pilot symbols of a known phase or information symbols included in at least one of packets and a common control channel of a received signal (figure 14H column14 lines 32-43).

As per claim 35 Song (US 6721299) discloses that the pilot symbols are included in at least one of packets and a common control channel of said received signal (figure 14A and 14B column13 lines 30-45).

Claims 15-18, 20, 22, 23, 26 and 29 are rejected under 35 U.S.C. 102(e) as being anticipated by Papasakellariou (US 6700919).

As per claim 15 Papasakellariou (US 6700919) discloses a channel estimation method for estimating channel variation using pilot symbols comprising a pilot symbol acquiring step for acquiring pilot symbols of a known phase included in a received packet (figure 4 block 52 column 9 lines 21-23); a tentative channel estimation step for implementing tentative channel estimation using said acquired pilot symbols (figure 4 block 52 column 9 lines 23-29); a tentative data decision information symbol generating step for compensating for the channel variation in accordance with a result of said tentative channel estimation and generating tentative data decision information symbols from the compensated information symbols (figure 4 block 54 column 9 lines 40-43); and a channel estimation step for generating information symbols wherefrom modulation components are removed using said tentative data decision information

symbols and implementing channel estimation using said pilot symbols and information symbols (figure 4 block 56 column 9 lines 61-66).

As per claim 16 Papasakellariou (US 6700919) discloses a tentative data decision information symbol generating step includes a weighting process for weighting said tentative data decision information symbols according to the reliability (figure 4 column 15 lines 21-25).

As per claim 17 Papasakellariou (US 6700919) discloses that the tentative data decision information symbol generating step includes an error correction process for error correction decoding said tentative data decision information symbols after error correction encoding again (figure 2 column 6 lines 42-45).

As per claim 18 Papasakellariou (US 6700919) discloses that the tentative data decision information symbol generating step includes an error correction process for error correction decoding said tentative data decision information symbols after error correction encoding again (figure 4 column 15 lines 21-25).

As per claim 20 Papasakellariou (US 6700919) discloses a communication device comprising a path search means (searcher) for detecting respective timings of path components included in a reception signal received via a multipath propagation path using pilot symbols of a known phase included in the reception signal (figure 3 column 6 line 66 to column 7 line 5); and channel estimation means for estimating channel variation using said pilot symbols (figure 3 block 26 column 6 lines 54-57).

As per claim 22 Papasakellariou (US 6700919) discloses a communication that includes a pilot symbol acquiring part for acquiring pilot symbols included in said

reception signal (figure 3 column 7 lines 6-15); and a channel estimation part for implementing channel estimation using said acquired pilot symbols (figure 3 block 26 column 6 lines 54-57).

As per claim 23 Papasakellariou (US 6700919) discloses a communication device including a tentative channel estimation part for implementing tentative channel estimation using the acquired pilot symbols (figure 2 block 26 column 9 lines 21-23); a tentative data decision information symbol generating part for compensating for the channel variation in accordance with a result of said tentative channel estimation and generating a tentative data decision information symbols from the compensated information symbols (figure 3 block 34 column 9 lines 23-29); and a channel estimation part for generating an information symbol wherefrom modulation components are removed using said tentative data decision information symbols and implementing channel estimation using said pilot symbols and information symbols (figure 3 block 34 column 9 lines 61-66).

As per claim 26 Papasakellariou (US 6700919) discloses a communication device for implementing channel estimation for estimating channel variation using pilot symbols comprising a pilot symbol acquiring part for acquiring pilot symbols of a known phase included in received packets (figure 3 column 7 lines 6-15); and a channel estimation part for implementing channel estimation using said acquired pilot symbols (figure 3 block 26 column 6 lines 54-57).

As per claim 29 Papasakellariou (US 6700919) discloses a communication device for implementing channel estimation for estimating channel variation using pilot

symbols comprising: a pilot symbol acquiring part for acquiring pilot symbols of a known phase included in received packets (figure 2 block 24 column 6 lines 57-60); a tentative channel estimation part for implementing tentative channel estimation using said acquired pilot symbols (figure 3 block 34 column 7 lines 21-34); a tentative data decision information symbol generating part for compensating for the channel variation in accordance with a result of said tentative channel estimation and generating a tentative data decision information symbols from the compensated information symbols (figure 3 block 39 column 8 lines 25-30); and a channel estimation part for generating information symbols wherefrom modulation components are removed using said tentative data decision information symbols and implementing channel estimation using said pilot symbols and information symbols (figure 3 block 40 and 34 column 8 lines 43-51).

Claims 19, 24 and 30 are rejected under 35 U.S.C. 102(b) as being anticipated by Abeda et at. (Performance comparisons of coherent SC/DS-CDMA, MC/DS CDMA.and MC-CDMA methods in downlink broadband wireless packet transmission. Technical research report RCS99-130 the Institute of Electronics, Information and Communication Engineers, 15 October, 1999 (IS.10.S9)).

As per claim 19 Abeda et al. disclose a channel estimation method for estimating channel variation using pilot symbols, said method comprising: a subcarrier acquiring step for acquiring a plurality of subcarriers included in received packets; a pilot symbol acquiring step for acquiring a plurality of pilot symbols of a known phase included in said plurality of subcarriers, respectively; and a channel estimation step for

implementing channel estimation for each of said subcarriers using said plurality of pilot symbols (point 2.1.2 MC-CDMA) .

As per claim 24 and 30 Abeda et al. disclose a pilot symbol acquiring part for acquiring pilot symbols included in said reception signal, including a subcarrier acquiring part for acquiring a plurality of subcarriers included in said reception signal and a pilot symbol acquiring step for acquiring a plurality of pilot symbols of a known phase included in the plurality of subcarriers (figure 4, point 2.1.2 MC-CDMA first paragraph); and a channel estimation part for implementing channel estimation using said acquired pilot symbols that implements channel estimation for each of said subcarriers using said plurality of pilot symbols (figure 4, point 2.1.2 MC-CDMA last paragraph).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5 and 25 are rejected under 35 U.S.C. 103(a) as being anticipated by Lee (Korean Pate Patent Publication 010054456), and further in view of Sutton (US 6721299).

As per claims 1 and 25 Lee (Korean Pate Patent Publication 010054456) discloses a channel estimation method for a multipath channel detecting respective timings of path components included a signal received via a multipath propagation path, comprising the steps of: a first channel estimation step for detecting respective timings

of path components using pilot symbols of a known phase included in said signal received via the multipath propagation path (figure 1 block 200); and a second channel estimation step for detecting respective timings of path components using information symbols derived from a signal demodulated according to said timings detected in the first path search step and said pilot symbols of a known phase (figure 1 block 400). Lee (Korean Pate Patent Publication 010054456) doesn't specifically disclose the use of path searcher. The path searcher will be inherit to the channel estimation in a multipath environment. Sutton (US 6721299) discloses the use of a path searcher in a multipath CDMA communication channel (figure 1 block 18 column 5 lines 2-7). It would have been obvious to one having ordinary skill in the art at the time the invention was made to incorporate in the channel estimation method disclosed by Lee with the path searcher technique disclosed by Sutton (US 6721299) in order to increase the signal-to-noise ration In the receiver and also because it is inherit in the multipath channel disclose by Lee (Korean Pate Patent Publication 010054456).

As per claim 2 Lee (Korean Pate Patent Publication 010054456) disclose claim 1. Lee (Korean Pate Patent Publication 010054456) doesn't specifically disclose the steps of: despreading said signal received via the multipath propagation path according to said timings detected in the first path search step; cophasing and summing the information symbols despreaded according to respective path timings in a symbol by symbol manner; demodulating and implementing data decision of said cophased and summed respective information symbols; and remodulating said data decision signal. Sutton (US 6721299) discloses that information symbols derived from the signal

demodulated according to the timings detected in the path search step are generated by implementing the steps of: despreading said signal received via the multipath propagation path according to said timings detected in the path search (figure 1 lock 6; cophasing and summing the information symbols despreaded according to respective path timings in a symbol by symbol manner (figure 1 block 8 and 10 column 4 line 20-21); demodulating and implementing data decision of said cophased and summed respective information symbols (figure 5 block 88 column 7 line 55-60); and remodulating said data decision signal (figure 1 block 18 column 5 line 2-7). The technique disclosed by Lee can be incorporated in the receiver disclosed by Sutton (US 6721299). It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the channel estimation method disclosed by Lee with the technique disclosed by Sutton (US 6721299) in order to obtain a higher data rate in the CDMA receiver disclosed by Sutton (US 6721299).

As per claim 3 Sutton (US 6721299) also discloses information symbols derived from the signal demodulated according to the timings detected in the first path search step are selected and fed back such that information symbols satisfying a predetermined condition are selected (figure 1 block 16 column 4 line 66 to column 5 line 7).

As per claim 4 Sutton (US 6721299) discloses that the second path search step is repeated until a predetermined condition is satisfied (figure 1 block 16 column 4 line 66 to column 5 line 7).

As per claim 5 Sutton (US 6721299) discloses the signal received via the multipath propagation path is transmitted in accordance with a multicarrier code division multiplex system (column 2 lines 61-67).

Claim 21 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Papasakellariou (US 6700919) as applied to claim 20 above, and further in view of Sutton (US 6721299).

As per claim 21 Papasakellariou (US 6700919) discloses claim 20, Papasakellariou (US 6700919) doesn't disclose that the path search (searcher) includes a first path search part for detecting respective timings of path components using said pilot symbols and a second path search part for detecting respective timings of path components using an information symbols derived from a signal demodulated according to said timings detected in the first path search part and said pilot symbols. Sutton (US 6721299) discloses path search means that includes a first path search part for detecting respective timings of path components using said pilot symbols and a second path search part for detecting respective timings of path components using an information symbols derived from a signal demodulated according to said timings detected in the first path search part and said pilot symbols. The path search device disclosed by Sutton (US 6721299) can be integrated in the communication device disclosed by Papasakellariou (US 6700919). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the path search device disclosed by Sutton (US 6721299) in the communication device disclosed by

Papasakellariou (US 6700919) in order to improve the signal to noise ratio of the received signal.

As per claim 31 Papasakellariou (US 6700919) discloses a recursively channel estimation communication device comprising: a channel estimation means for performing a first channel estimation step in which channel estimation is implemented for estimating channel variation after a path search step that implements a second channel estimation step in which channel estimation is implemented for estimating channel variation using information symbols derived from a signal demodulated after a first channel estimation step according to a timings detected in a path search step and said pilot symbols of a known phase, and recursively implementing channel estimation by repeating the processes of implementing a path search step using said information symbols demodulated after the second channel estimation step and pilot symbols and implementing the second channel estimation step using information symbols fed back. Sutton (US 6721299) discloses a recursively path search means for performing a first path search step in which respective timings of path components are detected using pilot symbols of a known phase included in a reception signal received via a multipath propagation path and a second path search step in which respective timings of path components are detected using information symbols derived from a signal demodulated after the first path search step and said pilot symbols of a known phase and recursively implementing path search repeating the processes of implementing said second path search step using said information symbols demodulated and pilot symbols. The iterative technique for path search disclosed by Sutton (US 6721299) can be integrated

with the iterative technique for channel estimation disclosed by Papasakellariou (US 6700919). It would have been obvious to one having ordinary skill in the art at the time the invention was made to use the iterative path search device disclosed by Sutton (US 6721299) in the iterative channel estimation communication device disclosed by Papasakellariou (US 6700919) in order to improve the signal to noise ratio of the received signal.

Claim 32, 33 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Papasakellariou (US 6700919) further in view of Sutton (US 6721299), and further in view of Song (US 6721299).

As per claim 32 Papasakellariou (US 6700919) and Sutton (US 6721299) disclose claim 31. Papasakellariou (US 6700919) and Sutton (US 6721299) don't disclose de use of a control common control channel. Song (US 6721299) discloses the use of pilot symbols included in packets and a common control channel of the received signal. The device disclosed by Papasakellariou (US 6700919) and Sutton (US 6721299) can be incorporated in the common control channel disclosed by Song (US 6721299). It would have been obvious to one having ordinary skill in the art at the time the invention was made to integrate the common control channel disclosed by Song (US 6721299) in the iterative channel estimation communication device disclosed by Papasakellariou (US 6700919) and Sutton (US 6721299) in order to reduce the overhead and increase the data rate the received signal.

As per claim 33 Papasakellariou (US 6700919), Sutton (US 6721299) and Song (US 6721299) disclose claim 32. Song (US 6721299) also discloses pilot symbols multiplexed with at least one of said packets and said common control channel.

As per claim 36 Song (US 6721299) discloses claims 34 and 35. Song (US 6721299) doesn't disclose an iterative path search and channel estimation search systems. Papasakellariou (US 6700919), Sutton (US 6721299) disclose feedback means for feeding back information symbol and recursively implements path search and channel estimation by repeating processes of implementing path search using information symbols decoded after channel estimation and pilot symbols and implementing channel estimation using information symbols fed back via said feedback means in accordance with a timing detected in said path search and pilot symbols. It would have been obvious to one having ordinary skill in the art at the time the invention was made to supplement the path search and channel estimation device disclosed by Song (US 6721299) with the iterative path search and channel estimation communication device disclosed by Papasakellariou (US 6700919) and Sutton (US 6721299) in order to increase the signal to noise ration of the received signal.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Lim et al. (US 6240099) disclose a multi-user code division multiple access receiver based on recursive estimation. Kowalski et al. (US 6208632) disclose a system and method for CDMA channel estimation. Sugimoto et al. (US 6661835) disclose a

receiving device and channel estimator for use in a CDMA communication system. Kubo et al. (JP Publication 2001053644) discloses a decision feedback type searcher using pilot and information signals.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Juan A. Torres whose telephone number is (571) 272-3119. The examiner can normally be reached on Monday-Friday 9:00 AM - 5:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad H. Ghayour can be reached on (571) 272-3021. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

JAT 11-23-2004

M. Gh

MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER